DOCUMENT RESUME

ED 423 949 PS 025 282

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TITLE Words and Gestures: Infants' Interpretations of Different Forms of Symbolic Reference.
PUB DATE 1997-04-00
NOTE 7p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (62nd, Washington, DC, April 3-6, 1997).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Age Differences; Cognitive Development; *Infants; *Language Acquisition; Oral Language; *Receptive Language; *Symbolic Learning; *Verbal Learning

ABSTRACT

Three experiments examined the relation between language acquisition and other symbolic abilities in 18- and 26-month old infants. Infants' ability to learn either words or symbolic gestures as names for object categories were compared across age groups. Findings indicated that infants at both ages learned novel words as symbols for object categories. However, infants' success at learning gestures as symbols changed over development. At 18 months, infants spontaneously learned both gestures and words as symbols; at 26 months, infants spontaneously learned words, but not gestures, as symbols. The older infants succeeded in learning novel gestures as symbols only when given additional practice with the gestural medium. This clear developmental pattern supports the prediction that an initial general ability to learn symbols (both words and gestures) develops into a more focused tendency to use words as the predominant symbolic form in hearing infants. (JPB)

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Words and gestures: Infants' interpretations of different forms of symbolic reference

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Abstract

The study of the relation between language acquisition and other symbolic abilities has a long history in the field of cognitive development. In three experiments, we examine this relation directly. We compare 18- and 26-month-old hearing infants' ability to learn either words or symbolic gestures as names for object categories (e.g., fruit, vehicles). Infants at both ages learned novel words as symbols for object categories. However, infants' success at learning gestures as symbols changed over development. At 18 months, infants spontaneously learned both gestures and words as symbols; at 26 months, infants spontaneously learned words, but not gestures, as symbols. The older infants succeeded in learning novel gestures as symbols only when given additional practice with the gestural medium. This clear developmental pattern supports the prediction that an initial general ability to learn symbols (both words and gestures) develops into a more focused tendency to use words as the predominant symbolic form in hearing infants.

Background and Predictions

Recent research has documented that infants as young as 12 months of age appreciate that novel words can refer to and stand for object categories (Waxman & Hall, 1993; Waxman & Markow, 1995; Woodward, Markman & Fitzsimmons, 1994). At around the same age that infants acquire their first words, they spontaneously begin to use symbolic gestures (e.g., flapping their hands to indicate a bird). These symbolic gestures are used in much the same way that words are used, i.e., to name and request objects or actions (Acredolo & Goodwyn, 1985, 1988). Together these findings suggest that infants possess an initial, general ability to acquire communicative symbols that includes both words and gestures.

The literature on symbolic gestures also reveals an interesting developmental trend. With age and experience, infants use of words appears to diverge from their use of gestures. Although infants initially employ symbolic gestures to communicate, this tendency declines with age (Acredolo & Goodwyn, 1988; Iverson et al.)

These findings lead to the central hypotheses of this project:

(1) In the early stages of productive language, infants can readily learn both novel words and novel gestures as symbols for object categories.
(2) At more advanced stages of language development, hearing infants will be more likely to learn a novel word than a gesture as a symbol for an object category.

Study 1

We compared hearing infants' interpretations of words and gestures as symbols for object categories. We taught 18- and 26-month-old infants either novel words or novel gestures as names for object categories. Our goal was to examine the infants' ability to map and extend these symbols at two distinct points in development.

Predictions:
At 18 months, infants will be equally successful at learning gestures and words as symbols.

At 26 months, infants will be more successful at learning words than gestures.

Subjects

48 18-month-olds (16.8 -18.6 months)
none of these subjects were combining words

48 26-month-olds (25.1-26.7 months)
all of these subjects were combining words

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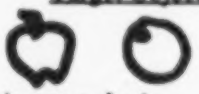
Procedure

Introduction Phase: The experimenter focused attention on two members (e.g., apple and orange) of the target category (e.g., fruit). She referred to these objects a total of 10 times, using either a novel word, a novel gesture, or no symbol.

Target Objects



Word: "We call this one a *dax!* See the *dax*?"
Gesture: "We call this one [*gesture*]! See this [*gesture*]?"
No-Symbol: "Look at this one! See this?"

Test Phase: The experimenter used one object from the Introduction Phase as a target (e.g., an orange). She then asked infants to select between a) a category member (e.g., a pear) and b) an unrelated distractor (e.g., a chair). There were six trials for each target category (fruit and vehicle).

Target Object

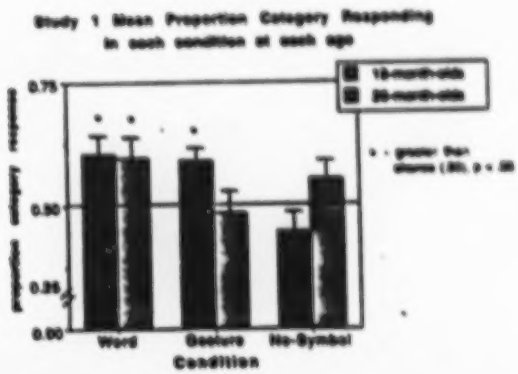
Word: "Look at the *dax*!"
Gesture: "Look at this [*gesture*]!"
No-Symbol: "Look at this!"

Choice Objects

	Category	Distractor
Trial 1		
Trial 2		
. . .		
Trial 6		

Word: "Can you find another *dax*?"
Gesture: "Can you find another [*gesture*]?"
No-Symbol: "Can you find another one?"

Results



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- In the No-Symbol control condition, infants at both ages selected randomly between the category choices and the distractors.
- In the Word condition, infants at both ages selected category members more frequently than those in the No-Symbol condition (Waxman & Hall, 1993; Woodward et al., 1994).

- In the Gesture condition, 18-month-olds selected category members as frequently as those in the Word condition. However, 26-month-olds did not differ from the No-Symbol condition.

Discussion

- 18-month-olds readily learned both words and gestures as symbols.
- 26-month-olds learned words as symbols quite readily, but showed no evidence of learning gestures as symbols.
- This supports the hypothesis that there is an early, general ability to learn symbols, and that this ability becomes more canalized over development.

Question:
Why did the older infants fail to learn gestures as symbols?

Are hearing infants this age unable to learn gestural symbols or do they simply require a different form of input in order to understand that gestures, like words, can be used symbolically? In Studies 2 and 3, we explore the circumstances under which infants at this age would succeed at learning gestures as symbols for object categories.

Study 2

We attempted to teach 27-month-olds that a gesture, like a word, may be used to name an object. We introduced symbols (either words or gestures) within the context of a familiar naming routine. This naming routine may help clarify the function of the gestures for the infants. In addition, the naming routine permits us to remove the gestures from a spoken sentence frame, which may have been pragmatically confusing for the infants. Instead, we introduce the words and gestures as isolated symbols.

Prediction:

When symbols are presented simply, within a familiar naming routine, 27-month-olds will succeed in learning both words and gestures as symbols.

Subjects

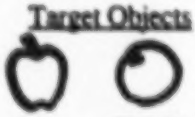
36 27-month-old infants (24.5 - 29.8 months)

Procedure

The infants were introduced to a puppet named Charlie the Cricket and were taught Charlie's "special names for things". The experimenter and Charlie engaged in a "dialogue" during which the novel symbols were introduced.

Introduction Phase: The Experimenter and Charlie focused attention on two members (e.g., apple and orange) of the target category (e.g., fruit). They referred to the objects a total of 10 times, using a novel word, a novel gesture, or no symbol.

Target Objects



	Experimenter	Charlie	Experimenter
Word:	"Charlie, what's this? Listen!"	"A dax!"	"Wow! A dax!"
Gesture:	"Charlie, what's this? Watch!"	[Gesture]	"Wow! [Gesture]"
No-Symbol:	"Charlie, look at that!"	[points]	"Charlie likes that!"

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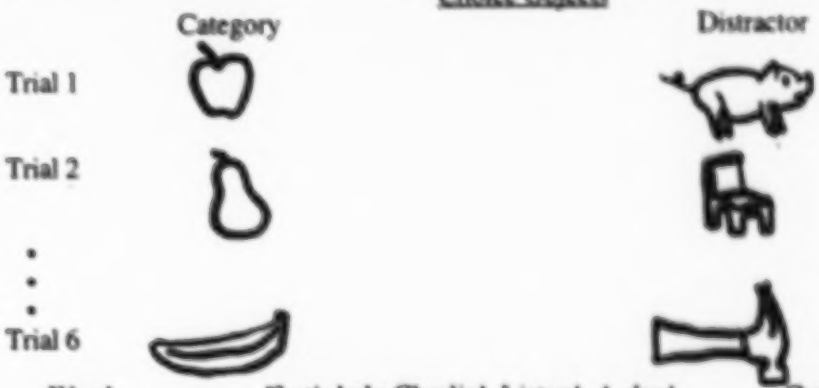
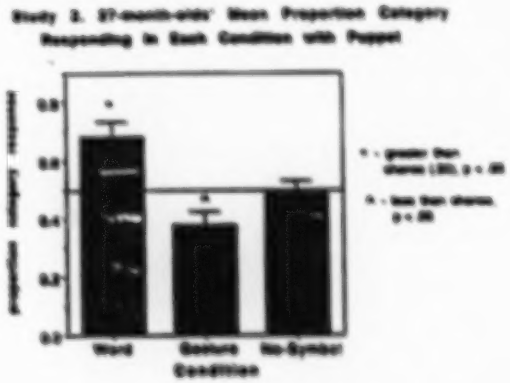
Test Phase: We asked the infants to select between another category member (e.g., a pear) and an unrelated distractor (e.g., a chair). There were six trials for each target category.

Choice Objects



Word: "Let's help Charlie! Listen! A *dax*! Can you find it?"
Gesture: "Let's help Charlie! Watch! [*gesture*] Can you find it?"
No-Symbol: "Let's help Charlie! Can you find one for him?"

Results



- 27-month-olds in the Word condition selected category members more frequently than those in the No-Symbol condition, just as in Study 1.
- 27-month-olds in the Gesture condition did not differ from the No-Symbol condition, just as in Study 1.

Discussion

- 27-month-olds again showed no evidence of learning gestures as symbols for object categories, although they learned words as symbols quite readily.
- Removing the gestures from a spoken sentence frame and embedding them in a familiar naming routine did not facilitate 27-month-olds' interpretation of gestures as symbols.
- Perhaps 27-month-old infants need more experience **using** gestures as symbols, before they can interpret novel gestures symbolically.

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Study 3

We provided a training session in which 27-month-olds receive practice using and observing symbolic gestures, with reinforcement. Following the training period, we tested infants' interpretations of words and symbolic gestures using the same procedure as in Study 2.

Prediction:

When the infants are provided with additional experience using gestures, 27-month-olds will successfully learn gestures (like words) as symbols.

Subjects

36 27-month-old infants (25.9 - 30.5 months)

Procedure

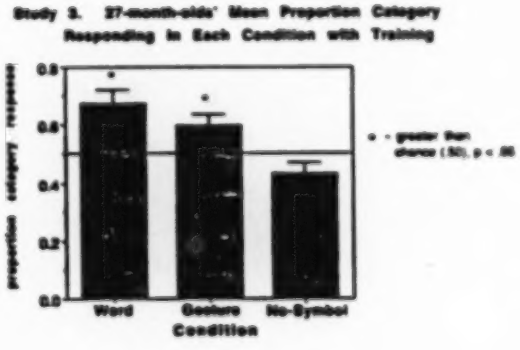
Training Phase:

The Experimenter and Charlie introduced the child to two familiar objects (a cookie and a fish) using either a novel word, a novel gesture, or no-symbol, as in Study 2. The Experimenter then elicited production and comprehension of the symbols. The Experimenter reinforced correct answers with clapping and cheering. Incorrect responses were explicitly corrected.

Introduction and Test Phases:

Identical to Study 2.

Results



- 27-month-olds in both the Word and the Gesture condition selected category members more frequently than those in the No-Symbol condition.

Discussion

- 27-month-old infants are capable of learning both words and gestures as symbols for object categories.
- However, these older infants require explicit training in order to interpret gestures symbolically. Such training was not necessary for the interpretation of novel words. Indeed, added training had no influence on performance in the Word condition.

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Conclusions

- **Hearing infants can learn both words and gestures as symbols at the onset of productive symbol use.**
  18-month-old hearing infants spontaneously interpret both spoken words and gestures as symbols, after only 10 repetitions of the symbols paired with their referents.

- **Older infants require supplementary training to interpret gestures as symbols, but readily interpret words as symbols.**
  Although 27-month-olds hearing infants learning a spoken language can learn to interpret gestures as symbols for object categories, they do not do so spontaneously. This is in marked contrast to their interpretations of novel words, which they learn readily.

- **A general symbolic capacity early in development becomes canalized over time.**
  At the onset of symbol use, words do not appear to have a clear advantage over gestures as symbols for object categories. However, later in development, infants come to learn novel words more readily than novel gestures.

Points for Discussion

Will young infants interpret any potential symbolic form as a symbol?
A truly general symbolic capacity implies that virtually anything may be a candidate symbol. However, it may be that gestures are particularly rich, salient, and familiar communicative forms (McNeill, 1992). Thus, 18-month-olds may not be willing to generalize this ability to other symbolic forms such as musical sequences or color chips.

Why does infant symbol interpretation become canalized?
We suspect that the divergence between words and gestures is due predominantly to the difference in the amount and type of experience children receive with words relative to gestures.

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